PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of:	)	
	)	
David L. Graumann	)	Examiner: Justin Michalski
	)	
Serial No.: 09/603,939	)	Group Art Unit: 2615
	)	
Filed: June 27, 2000	)	Docket: P8799
	)	
For: ENHANCED ACOUSTIC TRANSMISSION SYSTEM AND METHOD	)	

APPEAL BRIEF UNDER 37 CFR 41.37

Mail Stop Appeal Brief
Commissioner for Patents
P.O.Box 1450
Alexandria, VA 22313-1450

Sir:

This Brief is submitted in support of the Appeal in the above-identified application. Authorization to charge a credit card has been provided upon electronic filing of this appeal brief to extend the term for submission from October 16, 2006 to January 16, 2007. Applicants believe that no other extension of time is required. However, Applicants conditionally petition for an extension of time to provide for the possibility that the need for such a petition has been inadvertently overlooked. As provided below, please charge Deposit Account No. 50-2121 for any required fee.

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1. REAL PARTY IN INTEREST

The real party in interest of the above-captioned patent application is the assignee, INTEL CORPORATION.

2. RELATED APPEALS AND INTERFERENCES

No prior or pending appeals, interferences or judicial proceedings are known to appellant, appellant's legal representative, or assignee, which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in this pending appeal.

3. STATUS OF THE CLAIMS

Claims 1-20 and 30-36 are rejected. Claims 21-29 are canceled. Claims 1-20 and 30-36 are on appeal.

4. STATUS OF AMENDMENTS

No amendments have been filed subsequent to final rejection.

5. SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 1 is directed to a method of generating an enhanced acoustic transmission signal 100. The method includes generating a carrier signal 140, receiving data 110 and generating a data signal 130 representing the data, and modulating the carrier signal 140 with the data signal 130 to form a modulated carrier signal 160 at a carrier frequency (p. 4, ll. 7-17, p. 5, ll. 9-13, and p. 6, ll. 1-3)[1]. The method also includes generating a masking signal 170 to mask the modulated carrier signal 160 from being audible by a human ear (p. 5, ll. 11-12, and p. 6, ll. 14-15). The method further includes receiving audio 200 and generating an audio signal 190 based on the audio 200 and removing a frequency band surrounding the carrier frequency from the audio signal 190 (p. 8, ll. 4-10). The method further includes combining the modulated carrier signal 160, the masking signal 170, and the audio signal 190 to form the enhanced acoustic transmission signal 100 (p. 9, ll. 7-9).

Independent claim 7 is directed to a method of decoding an enhanced acoustic transmission signal 100. The enhanced acoustic transmission signal 100 includes a modulated carrier signal 160 formed by modulating a carrier signal 140 at a carrier frequency with a data signal 130 representing data, a masking signal 170 adapted to mask the modulated carrier signal 160 from being audible by a human ear, and an audio signal 190 modified so that a frequency band surrounding the carrier frequency is removed from the audio signal 190 (p. 9, ll. 6-13). The method includes receiving the enhanced acoustic transmission signal 100 and filtering the enhanced acoustic transmission signal 100 to isolate the modulated carrier signal 160 from the masking signal 170 and the audio signal 190 of the enhanced acoustic transmission signal 100 (p. 10, ll. 10-12). The method also includes demodulating the modulated carrier signal 160 to extract the data signal 130 from the modulated carrier signal 160 and decoding the data signal 130 to extract the data 110 (p. 10, ll. 18-22).

[1] Page and line numbers refer to the specification as filed.

Independent claim 9 is directed to a system to generate an enhanced acoustic transmission signal 100. A carrier signal generator 122 generates a carrier signal 140 and a data signal generator 120 receives data and generates a data signal 130 representing the data (p. 4, ll. 10-23, and p. 5, ll. 10). A signal modulator 150 modulates the carrier signal 140 with the data signal 130 to form a modulated carrier signal 160 at a carrier frequency (p. 6, ll. 1-3). A masking signal generator 124 generates a masking signal 170 to mask the modulated carrier signal 160 from being audible by a human ear (p. 6, ll. 12-23). An audio input device 210 receives audio 200 and generates an audio signal 190 based on the audio (p. 8, ll. 4-7). A notch filter 220 removes a frequency band surrounding the carrier frequency from the audio signal 190 (p. 8, ll. 7-17). A signal adder 400 combines the modulated carrier signal 160, the masking signal 170, and the audio signal 190 to form the enhanced acoustic transmission signal 100 (p 9, ll. 11-13).

Independent claim 18 is directed to a system to decode an enhanced acoustic transmission signal 100. The enhanced acoustic transmission signal 100 includes a modulated carrier signal 160 formed by modulating a carrier signal 140 at a carrier frequency with a data signal 130 representing data, a masking signal 170 adapted to mask the modulated carrier signal 160 from being audible by a human ear, and an audio signal 190 modified so that a frequency band surrounding the carrier frequency is removed from the audio signal 190 (p. 9, ll. 6-13). A receiver receives the enhanced acoustic transmission signal 100 and a filter 500 filters the enhanced acoustic transmission signal 100 to isolate the modulated carrier signal 160 from the masking signal and the audio signal 190 of the enhanced acoustic transmission signal 100 (p. 10, ll. 10-12). A demodulator 520 demodulates the modulated carrier signal 160 to extract the data signal 130 from the modulated carrier signal 160. A decoder 530 decodes the data signal 130 to extract the data 110 (p. 10, ll. 17-21).

Independent claim 30 is directed to a method to generate an output audio signal. The method includes removing a range of frequencies in an audio signal 190 to produce a notched audio signal and generating a masking signal 170 that falls entirely within one portion of the

range of frequencies (p. 8, ll. 4-12 and p. 9, ll. 1-5). The method also includes generating a data signal 130, 160 that falls entirely within the range of frequencies and apart from the one portion (p. 8, ll. 19-21). The method further includes combining the notched audio signal 190, the masking signal 170, and the data signal 130, 160 to form the output audio signal 100 (p. 9, ll. 11-13).

Independent claim 34 is directed to a method of processing a combined audio signal. The method includes receiving the combined audio signal 100 including a masking signal 170 residing in a frequency range, a data signal 130, 160 residing in the frequency range, and audio information residing outside frequency range. The method also includes separating the masking signal 170 and the data signal 130, 160 in the frequency range from the audio information outside the frequency range and filtering the data signal 130, 160 in the frequency range from the masking signal 170 (p. 10, ll. 10-23).

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether claims 30-36 are anticipated under 35 U.S.C. §102(b) by U.S. Patent No. 4,876,617 to Best, et al.

Whether claims 1, 2, 4, 5, 9, 10, 12, 13, 16 and 17 are unpatentable under 35 U.S.C. §103(a) over U.S. Patent No. 6,584,138 to Neubauer, et al. in view of U.S. Patent No. 4,876,617 to Best, et al.

Whether claims 6, 14 and 15 are unpatentable under 35 U.S.C. §103(a) over U.S. Patent No. 6,584,138 to Neubauer, et al. in view of U.S. Patent No. 4,876,617 to Best, et al. and further in view of the article to Boney, et al. (1996 IEEE International Conference on Multimedia Computing and Systems, Jun. 19-23, Hiroshima, Japan, "Digital Watermarks for Audio Signals," pp. 473-480).

Whether claims 3 and 11 are unpatentable under 35 U.S.C. §103(a) over U.S. Patent No. 6,584,138 to Neubauer, et al. in view of U.S. Patent No. 4,876,617 to Best, et al. and further in view of U.S. Patent No. 4,035,838 to Bassani, et al.

Whether claims 7, 8, 18 and 19 are unpatentable under 35 U.S.C. §103(a) over U.S. Patent No. 6,584,138 to Neubauer.

Whether claim 20 is unpatentable under 35 U.S.C. §103(a) over U.S. Patent No. 6,584,138 to Neubauer in view of the article to Boney, et al. (1996 IEEE International Conference on Multimedia Computing and Systems, Jun. 19-23, Hiroshima, Japan, "Digital Watermarks for Audio Signals," pp. 473-480).

7. ARGUMENT

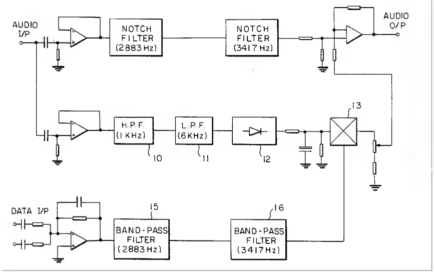
A. Introduction

The final Office Action rejected all of the pending claims as being either anticipated under 35 U.S.C. §102 or obvious under §103(a). In making these rejections, the Office primarily relies on U.S. Patent No. 4,876,617 to Best, et al. ("Best") and U.S. Patent No. 6,584,138 to Neubauer, et al. ("Neubauer"). Appellant submits that the Office Action has misapplied the teachings of at least Best and Neubauer and submits that these references, even if combined, do not disclose or teach the claimed limitations as asserted in the Office Action. Before addressing each of the rejections in detail, this Brief summarizes the disclosures in the Best and Neubauer references.

(i) U.S. Patent No. 4,876,617 to Best, et al.

Best discloses equipment for labeling audio signals, such as audio recordings (also referred to as programme content), with identification information such as the origins of the recording (see Best, Abstract, col. 1, lines 6-10). FIG. 1 of Best is reproduced below:

FIG. 1



An encoder, shown in FIG. 1 of Best, inserts binary information (also referred to as a code sequence) into two very narrow notches of the audio signal (see Best, col. 2, lines 17-20). A decoder or decoding circuit, shown in FIG. 4 of Best, separates the code from the programme content (see Best, col. 2, lines 67-68, and col. 3, lines 1-5). The center frequencies 2883 and 3417 Hz are chosen for the notches because they are between semi-tones on the tonic scale, which helps to minimize music breakthrough into the decoding circuits and to prevent exclusion of fundamental frequencies in the tonic scale (see Best, col. 2, lines 20-25).

The code sequence is formed of a plurality of bits represented by bursts of two different frequencies (see Best, col. 1, lines 15-25). The code frequencies are derived from a timing generator and are transformed to sinusoidal waveforms in the two bandpass filters 15, 16 (see Best, col. 2, lines 47-49). In particular, the lower frequency 2883 Hz designates the binary value of 0 and the higher frequency 3417 Hz designates the binary value of 1 (see Best, col. 2, lines 50-53 and col. 5, lines 56-59).

The encoder also includes a wide bandpass circuit consisting of a 1 KHz highpass filter 10 and a 6KHz lowpass filter 11 to ensure that the code insertion level is not determined by frequencies, either high or low, which do not adequately mask the code frequencies (see Best, Abstract, col. 2, lines 32-40). The envelope of the programme signal that passes through the filters 10, 11 is rectified by unit 12 and applied to a multiplier 13 with the code frequencies applied to the other input such that the amplitude of the code is kept at a fixed level below the programme (see Best, col. 2, lines 41-45). In other words, the code is only inserted into the programme when its content, both from the point of view of level and frequency distribution, will provide adequate masking of the code (see Best, col. 3, lines 50-57).

(ii) U.S. Patent No. 6,584,138 to Neubauer, et al.

Neubauer discloses a coding method and a coder for introducing a non-audible data signal into an audio signal (see Neubauer, Abstract). FIG. 1 of Neubauer is reproduced below:

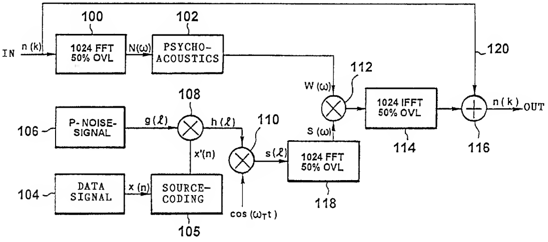


FIG.1

The audio signal is first transformed into a spectral range in transformation block 100 and a masking threshold W(ω) is determined using psychoacoustics block 102 (see Neubauer, col. 9, lines 42-45, and col. 10, lines 4-7 and 50-55). A pseudo-noise signal 106 and a data signal 104 are provided and multiplied with each other at BPSK baseband modulator 108 to provide a frequency-spread data signal. The use of spread-spectrum-modulation to spread the information or data signal to the entire transmission band reduces the susceptibility to interference phenomena and multipath propagation (see Neubauer, col. 4, lines 13-18).

The spread data signal is weighted with the masking threshold W(ω) through weighting block 112, resulting in no location in the audio spectrum having more noise energy introduced by the spread-spectrum signal than is perceptible to the human ear (see Neubauer, col. 12, lines 29-34). The audio signal 120 and the weighted data signal are then superimposed at superposition means 116 (see Neubauer, col. 9, lines 49-51 and col. 12, lines 43-44).

B. Rejection under 35 U.S.C. § 102(b) over U.S. Patent No. 4,876,617 to Best, et al.

The rejection of claims 30-36 as anticipated by U.S. Patent No. 4,876,617 to Best, et al. ("Best") under 35 U.S.C. §102(b) is improper because Best does not identically disclose each and every element and limitation recited in claims 30-36. Anticipation requires that "each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *In re Robertson,* 169 F.3d 743, 745, 49 USPQ2d 1949, 1950, citing *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

(i) Claims 30, 31, 33, 34, and 36

Best fails to disclose generating a masking signal that falls entirely within one portion of the range of frequencies removed from a notched audio signal, generating a data signal that falls entirely within the range of frequencies and separate from the one portion with the masking signal, and combining the notched audio signal, the masking signal, and the data signal, as recited independent claim 31.

Best discloses a method that merely inserts a data signal (i.e., the code sequence) into very narrow notches of a notched audio signal (see Best, col. 2, lines 17-18). In Best, the programme signal (i.e., the notched audio signal) provides the masking (see Best, col. 2, lines 35-38, and col. 3, lines 41-57). Best does not disclose generating a separate masking signal much less generating a masking signal that falls entirely within one portion of the range of frequencies that have been removed from a notched audio signal. Even if the notched audio signal in Best is considered to meet the claimed masking signal limitation, the notched audio signal cannot possibly fall entirely within one portion of its own notch.

The Office Action asserts that Best discloses a masking signal and refers to "signals from filters 10 and 11 in a frequency range of 1KHz to 6KHz." The filters 10, 11 in Best do not generate a masking signal. The programme signal that passes through the filters 10, 11 is rectified at unit 12 and applied to a multiplier 13 with the code frequencies applied at the other

input to keep the amplitude of the code below the level of the programme (see Best, col. 2, lines 41-45). The filters 10, 11 are used to provide wide bandpass filtering of this programme signal in the frequency range of 1 kHz to 6 KHz to ensure that the code insertion level is not determined by frequencies that do not adequately mask the code frequencies (see Best, col. 2, lines 35-38). Although the programme signal in Best is used to provide masking, the filtered and rectified programme signal applied to the multiplier 13 is used to control the insertion of the code, not to mask the code. Even if the programme signal that passes through filters 10, 11 could be considered a masking signal, such a masking signal spanning the frequency range of 1-6 kHz would not fall entirely within one portion of either of the notches at 2883 Hz and 3417 Hz.

Best also fails to disclose receiving a combined audio signal including a masking signal residing in a frequency range, a data signal residing in the frequency range, and audio information residing outside the frequency range and separating the masking signal and the data signal from the audio information, as recited in independent claim 34.

Best discloses a decoder circuit 4 to receive and decode the audio or programme signal including the code sequence inserted into the notches. The audio signal received by the decoder circuit 4 in Best does not include a masking signal in a frequency range and audio information residing outside the frequency range. As described above, Best discloses masking the code sequence with the programme signal and does not disclose a separate masking signal. Because the masking signal and the audio information are "one and the same" in Best, Best cannot disclose separating the masking signal and the data signal from the audio information. The bandpass filters in the decoding circuit of FIG. 4 of Best merely separate the code from the programme signal but do not separate a masking signal and the data signal from audio information.

Because Best does not identically disclose the methods recited in independent claims 31 and 34, appellant submits that Best does not anticipate these independent claims, and the claims

dependent therefrom. Accordingly, appellant requests that the rejection under 35 U.S.C. §102(b) be reversed.

(ii) Claim 32

Best also fails to disclose a masking signal that falls within a critical band of the data signal, as recited in dependent claim 32. As discussed above, Best discloses that the programme signal masks the code sequence. Appellant is unable to find any disclosure in Best of a masking signal that falls within a critical band of the data signal.

In the explanation of this rejection, the Office Action merely alludes to "bands of notch filters" but does not identify any portion of Best that discloses a masking signal that falls within a critical band of the data signal. If the Office Action is attempting to rely on principles of inherency, the Office Action does not make the required showing that a masking signal within a critical band of the data signal is necessarily present in Best. *See In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999). Thus, the Office Action fails to establish a *prima facie* case of anticipation of dependent claim 32. Because Best does not identically disclose the additional limitation recited in dependent claim 32, appellant submits that Best also does not anticipate this dependent claim. Accordingly, appellant requests that the rejection of dependent claim 32 under 35 U.S.C. §102(b) be reversed.

(iii) Claim 35

Best also fails to disclose a masking signal that resides in a first portion of the frequency range that is distinct from a second portion of the frequency range in which the data signal resides, as recited in dependent claim 35.

In the explanation of this rejection, the Office Action again asserts that the masking signal is in a frequency range of 1 kHz to 6 kHz. As discussed above, the programme signal that passes through the filters 10, 11 in the frequency range of 1 kHz to 6 KHz is not a masking signal. Even if the programme signal that passes through filters 10, 11 could be considered a masking signal, such a masking signal spanning the frequency range of 1-6 kHz is not in a frequency range that is

distinct from the frequencies of either of the notches centered at 2883 Hz and 3417 Hz. In fact, the frequency range of 1-6 kHz overlaps in frequency the bands at 2883 Hz and 3417 Hz.

Because Best does not identically disclose the additional limitation recited in dependent claim 35, appellant submits that Best also does not anticipate this dependent claim. Accordingly, appellant requests that the rejection of dependent claim 35 under 35 U.S.C. §102(b) be reversed.

C. Rejection under 35 U.S.C. §103(a) over U.S. Patent No. 6,584,138 to Neubauer, et al. in view of U.S. Patent No. 4,876,617 to Best, et al.

The rejection of claims 1, 2, 4, 5, 9, 10, 12, 13, 16 and 17 under 35 U.S.C. 103(a) over U.S. Patent No. 6,584,138 to Neubauer, et al. in view of U.S. Patent No. 4,876,617 to Best, et al. is improper because the Office Action fails to establish a *prima facie* case of obviousness. A claimed invention is unpatentable if the differences between it and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the pertinent art. 35 U.S.C. § 103(a) (2000); *Graham v. John Deere Co.*, 383 U.S. 1, 13-14 (1966). To reject claims in an application under Section 103, an examiner must show an unrebutted *prima facie* case of obviousness. *In re Rouffet*, 149 F.3d 1350, 1355 (Fed. Cir. 1998). In the absence of a proper *prima facie* case of obviousness, an applicant who complies with the other statutory requirements is entitled to a patent. *Id.* On appeal to the Board, an appellant can overcome a rejection by showing insufficient evidence of *prima facie* obviousness. *Id.* When a rejection depends on a combination of prior art references, there must be some teaching, suggestion, or motivation to combine the references to establish *prima facie* obviousness. *Id.* In order to establish a *prima facie* case of obviousness, all the claim limitations must also be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).

In the present case, as explained in detail below, the Office Action fails to provide an adequate teaching, suggestion or motivation to combine Neubauer and Best. In fact, the

disclosures of Neubauer and Best suggest that one of ordinary skill in the art would not be motivated to combine the teachings of these references. Moreover, even if Neubauer and Best could be combined, the combination of the disclosures in these references would not teach or suggest all of the claim limitations.

(i) Claims 1, 2, 4, 5, 9, 10, 12, 13, 16 and 17

One of ordinary skill in the art would not have been motivated to combine the teachings of Neubauer and Best as proposed in the Office Action. The Office Action asserts that "it would have been obvious to one of ordinary skill in the art at the time the invention was made to remove a frequency band around a carrier signal in order to insert coded data in a way to ensure that no music breaks through into the decoding circuits." Appellant submits that one of ordinary skill in the art would not apply this alleged teaching from Best to Neubauer.

Nothing in Neubauer suggests that there would be a problem with music or audio breaking through into the decoding circuits. To the contrary, Neubauer discloses one advantage of its disclosed method is that information is introduced into an audio signal without being perceived by the human ear while being safely decoded by a detector (see Neubauer, col. 4, lines 10-13). The non-audibility is obtained in that the audio signal (e.g., a music signal) to which the data signal or information is added is subjected to psychoacoustics calculation (see Neubauer, col. 4, lines 46-50). Thus, one of ordinary skill in the art, even knowing the advantages of the teachings in Best, would not have been motivated to apply those teachings to Neubauer because there is no need to solve this problem in Neubauer.

Even if there were a need to correct music breakthrough in Neubauer, one of ordinary skill in the art would not use the teaching of Best because Neubauer and Best disclose two very different approaches to inserting data signals into audio signals. In Neubauer, the signal that is superimposed with the audio signal is a weighted frequency-spread data signal (see Neubauer, Abstract). Neubauer indicates that the use of spread-spectrum-modulation to spread the information or data signal to the entire transmission band reduces the susceptibility to

interference phenomena and multipath propagation (see Neubauer, col. 4, lines 13-18). In Best, on the other hand, the information is inserted into two very narrow notches to facilitate the decoding process (see Best, col. 2, lines 17-20). The minimizing of music breakthrough in Best is a result of selecting the center frequencies of the notches 2883 Hz and 3417 Hz between semi-tones in the tonic scale (see Best, col. 2, lines 20-22).

Even if the teaching in Best of notches in the audio signal were applied to Neubauer, appellant submits that the frequency-spread data signal in Neubauer could not be inserted into such narrow notches. To apply this teaching to Neubauer would require a modification of Neubauer eliminating the use of a frequency-spread data signal that spreads the data signal to the entire transmission band. Such a modification of Neubauer would change the principle of operation and would render the method in Neubauer unsatisfactory for its intended purpose of spreading the data signal to the entire transmission band. Because the proposed modification of a reference cannot change the principle of operation of the reference or render the reference unsatisfactory for its intended purpose, the proposed combination of Best and Neubauer would not have been obvious. *See In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

Because one of ordinary skill in the art would not have been motivated to combine Neubauer and Best, appellant submits that claims 1, 2, 4, 5, 9, 10, 12, 13, 16 and 17 would not have been obvious over Neubauer in view of Best and the Office Action fails to establish a *prima facie* case of obviousness. Accordingly, appellant requests that the rejection under 35 U.S.C. 103(a) over Neubauer in view of Best be reversed.

Even if Neubauer and Best could be combined, the combination of the disclosures fails to teach or suggest all of the claimed limitations recited in independent claims 1 and 9. Independent claims 1 and 9 both recite removing a frequency band surrounding the carrier frequency. Even if Neubauer could be modified to apply the teachings of Best, as proposed in the Office Action, such a modification would not result in a method or system that removes a frequency band surrounding a carrier frequency. As mentioned above, Best teaches that the center frequencies of

the notches are chosen to be between semi-tones in the tonic scale. Thus, a combination of Neubauer and Best, if it were possible, would merely result in removing a frequency band around these center frequencies (i.e., 2883 Hz and 3417 Hz) and not surrounding a carrier frequency of a carrier signal in Neubauer.

Moreover, appellant submits that the Office Action does not properly apply Neubauer to the other elements and limitations recited in independent claims 1 and 9. Independent claim 1 also recites modulating the carrier signal with the data signal to form a modulated carrier signal at a carrier frequency and generating a masking signal to mask the modulated carrier signal from being audible by a human ear. Independent claim 9 similarly recites a signal modulator to modulate the carrier signal with the data signal to form a modulated carrier signal at a carrier frequency and a masking signal generator to generate a masking signal to mask the modulated carrier signal from being audible by a human ear.

The Office Action asserts that the modulator 110 in Neubauer modulates the carrier signal $\cos(\omega_T t)$ and asserts that the pseudo-noise signal 106 in Neubauer is the masking signal that masks a modulated carrier signal. To the contrary, Neubauer discloses first multiplying the noise signal 106 and the data signal 104 and then supplying the resulting signal to the modulator 110 for modulating onto a cosinusoidal carrier $\cos(\omega_T t)$ (see Neubauer, col. 12, lines 1-9). Thus, the noise signal 106 in Neubauer is applied directly to a data signal 104 before the data signal 104 is modulated. Neubauer does not modulate the carrier signal $\cos(\omega_T t)$ with the data signal 104 and then generate the pseudo-noise signal 106 to mask a modulated carrier signal.

Because any combination of Neubauer and Best, even if possible, would not teach or suggest all of the claimed limitations, appellant further submits that the Office Action fails to establish a *prima facie* case of obviousness. Accordingly, Appellant requests that the rejection under 35 U.S.C. 103(a) over Neubauer in view of Best be reversed for this additional reason.

D. Rejection under 35 U.S.C. §103(a) over U.S. Patent No. 6,584,138 to Neubauer, et al. in view of U.S. Patent No. 4,876,617 to Best, et al. and further in view of the article to Boney, et al.

(i) Claims 6, 14 and 15

The rejection of claims 6, 14 and 15 under 35 U.S.C. 103(a) is based on the combination of Neubauer and Best and further in view of the article to Boney, et al. (1996 IEEE International Conference on Multimedia Computing and Systems, Jun. 19-23, Hiroshima, Japan, "Digital Watermarks for Audio Signals," pp. 473-480). Because this rejection requires the same combination of Neubauer and Best asserted for independent claims 1 and 9, appellant submits that that the Office Action fails to establish a *prima facie* case of obviousness for claims 6, 14 and 15 for the same reasons stated above.

E. Rejection under 35 U.S.C. §103(a) over U.S. Patent No. 6,584,138 to Neubauer, et al. in view of U.S. Patent No. 4,876,617 to Best, et al. and further in view of U.S. Patent No. 4,035,838 to Bassani, et al.

(i) Claims 3 and 11

The rejection of claims 3 and 11 under 35 U.S.C. 103(a) is based on the combination of Neubauer and Best and further in view of U.S. Patent No. 4,035,838 to Bassani, et al. ("Bassani"). Because this rejection requires the same combination of Neubauer and Best asserted for independent claims 1 and 9, appellant submits that that the Office Action fails to establish a *prima facie* case of obviousness for claims 3 and 11 for the same reasons stated above.

F. Rejection under 35 U.S.C. §103(a) over U.S. Patent No. 6,584,138 to Neubauer, et al.

The rejection of claims 7, 8, 18, and 19 under 35 U.S.C. 103(a) over U.S. Patent No. 6,584,138 to Neubauer, et al., by itself, is improper because the Office Action fails to establish a

prima facie case of obviousness. Even when obviousness is based on a single prior art reference, there must be a showing of a suggestion or motivation to modify the teachings of that reference. *In re Kotzab*, 217 F.2d 1365, 1370 (Fed. Cir. 2000). The motivation, suggestion or teaching may come explicitly from statements in the prior art, the knowledge of one of ordinary skill in the art, or the nature of the problem to be solved. *Id.* Although the teaching, suggestion or motivation may be implicit, there must be evidence of the teaching, suggestion or motivation and broad conclusory statements standing alone are not evidence. *Id.*

(i) Claims 7, 8, 18 and 19

Neubauer, even if modified as proposed in the Office Action, fails to teach or suggest an enhanced acoustic transmission signal including a modulated carrier signal, a masking signal, and an audio signal modified so that a frequency band surrounding the carrier frequency is removed from the audio signal, as recited in independent claims 7 and 18. In rejecting independent claims 1 and 9, the Office Action states that "Neubauer does not disclose removing a frequency bands [sic] surrounding the carrier frequency from the audio signal." In rejecting independent claims 7 and 18, however, the Office Action appears to ignore this claimed limitation.

Although the limitation "audio signal modified so that a frequency band surrounding the carrier frequency is removed from the audio signal" is recited in the preamble of claims 7 and 18, appellant submits that this limitation should be given patentable weight. The dependence on a particular preamble phrase for antecedent basis may limit claim scope because it indicates a reliance on both the preamble and the claim body to define the claimed invention. *See Catalina Mktg. Int'l v. Coolsavings.com, Inc., 289 F.3d 801, 808, 62 USPQ2d 1781, 1785 (Fed. Cir. 2002).* In claims 7 and 18, the preamble language "modified so that a frequency band surrounding the carrier frequency is removed from the audio signal" defines the audio signal and the audio signal is recited in the body of the claims as being isolated by the filter or filtering. Thus, the defining language "modified so that a frequency band surrounding the carrier frequency

is removed from the audio signal" limits the claimed method and system in respective claims 7 and 18.

Because the Office Action fails to provide any teaching, suggestion or motivation of this missing claim limitation, appellant submits that the Office Action fails to establish *prima facie* obviousness of independent claims 7 and 18 and the claims dependent therefrom. Accordingly, appellant requests that the rejection under 35 U.S.C. 103(a) over Neubauer, by itself, be reversed.

F. Rejection under 35 U.S.C. §103(a) over U.S. Patent No. 6,584,138 to Neubauer in view of the article to Boney, et al.

(i) Claim 20

The rejection of claim 20 under 35 U.S.C. 103(a) is based on the combination of Neubauer and the article to Boney, et al. (1996 IEEE International Conference on Multimedia Computing and Systems, Jun. 19-23, Hiroshima, Japan, "Digital Watermarks for Audio Signals," pp. 473-480). Because this rejection requires the same modification of Neubauer asserted for independent claim 18, appellant submits that that the Office Action fails to establish a *prima facie* case of obviousness for the same reasons stated above.

9. SUMMARY

The Examiner erred in rejecting claims 1-20 and 30-36. The appellant respectfully requests reversal of these rejections and allowance of these claims.

Respectfully submitted,

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APPENDIX I - CLAIMS

The Claims on Appeal

1. A method of generating an enhanced acoustic transmission signal, the method comprising:

generating a carrier signal;

receiving data and generating a data signal representing the data;

modulating the carrier signal with the data signal to form a modulated carrier signal at a carrier frequency;

generating a masking signal to mask the modulated carrier signal from being audible by a human ear;

receiving audio and generating an audio signal based on the audio;

removing a frequency band surrounding the carrier frequency from the audio signal; and

combining the modulated carrier signal, the masking signal, and the audio signal to form the enhanced acoustic transmission signal.

2. The method according to claim 1, wherein the carrier signal is a sine wave.

3. The method according to claim 2, wherein the modulated carrier signal is a pulsed sine wave.

4. The method according to claim 1, wherein the masking signal is narrowband random noise.

5. The system according to claim 1, wherein the modulated carrier signal is at a level that is detectable by a decoding system while still being masked by the masking signal.

6. The system according to claim 1, wherein the masking signal has a bandwidth less than one critical band of the modulated carrier signal.

7. A method of decoding an enhanced acoustic transmission signal including a modulated carrier signal formed by modulating a carrier signal at a carrier frequency with a data signal representing data, a masking signal adapted to mask the modulated carrier signal from being audible by a human ear, and an audio signal modified so that a frequency band surrounding the carrier frequency is removed from the audio signal, the method comprising;

receiving the enhanced acoustic transmission signal;

filtering the enhanced acoustic transmission signal to isolate the modulated carrier signal from the masking signal and the audio signal of the enhanced acoustic transmission signal;

demodulating the modulated carrier signal to extract the data signal from the modulated carrier signal; and

decoding the data signal to extract the data.

8. The method according to claim 7, wherein the modulated carrier signal is isolated from the masking signal by using a finite impulse response (FIR) filter.

9. A system to generate an enhanced acoustic transmission signal, the system comprising:

a carrier signal generator to generate a carrier signal;

a data signal generator to receive data and to generate a data signal representing the data;

a signal modulator to modulate the carrier signal with the data signal to form a modulated carrier signal at a carrier frequency;

a masking signal generator to generate a masking signal to mask the modulated carrier signal from being audible by a human ear;

an audio input device to receive audio and to generate an audio signal based on the audio;

a notch filter to remove a frequency band surrounding the carrier frequency from the audio signal; and

a signal adder to combine the modulated carrier signal, the masking signal, and the audio signal to form the enhanced acoustic transmission signal.

10. The system according to claim 9, wherein the carrier signal generator is a sine wave generator that generates a sine wave.

11. The system according to claim 10, wherein the modulated carrier signal is a pulsed sine wave.

12. The system according to claim 9, wherein the masking signal generator is a narrowband random noise generator to generate narrowband random noise.

13. The system according to claim 9, wherein the modulated carrier signal is at a level that is detectable by a decoding system while still being masked by the masking signal.

14. The system according to claim 9, wherein the system is a telephone system having a microphone connected to the audio input device to receive audio, and a data input device connected to the data signal generator to enter data into the system.

15. The system according to claim 9, wherein the masking signal has a bandwidth less than one critical band of the modulated carrier signal.

16. The system according to claim 9, wherein the modulated carrier signal and the masking signal are first combined to form a masked encoded signal, then the audio signal is combined with the masked encoded signal to form the enhanced acoustic transmission signal.

17. The system according to claim 9, wherein the modulated carrier signal, the masking signal, and the audio signal are combined simultaneously to form the enhanced acoustic transmission signal.

18. A system to decode an enhanced acoustic transmission signal including a modulated carrier signal formed by modulating a carrier signal at a carrier frequency with a data signal representing data, a masking signal adapted to mask the modulated carrier signal from being audible by a human ear, and an audio signal modified so that a frequency band surrounding the carrier frequency is removed from the audio signal, the system comprising:

a receiver to receive the enhanced acoustic transmission signal;

a filter to filter the enhanced acoustic transmission signal to isolate the modulated carrier signal from the masking signal and the audio signal of the enhanced acoustic transmission signal;

a demodulator to demodulate the modulated carrier signal to extract the data signal from the modulated carrier signal; and

a decoder to decode the data signal to extract the data.

19. The system according to claim 18, wherein the modulated carrier signal is isolated from the masking signal by using a finite impulse response (FIR) filter.

20. The system according to claim 18, wherein the system is a telephone system having a speaker to produce audio from the audio signal, and a display to show the data extracted from the modulated carrier signal.

21-29. (Canceled)

30. A method to generate an output audio signal, comprising:

removing a range of frequencies in an audio signal to produce a notched audio signal;

generating a masking signal that falls entirely within one portion of the range of frequencies;

generating a data signal that falls entirely within the range of frequencies and apart from the one portion; and

combining the notched audio signal, the masking signal, and the data signal to form the output audio signal.

31. The method of claim 30, further comprising:

transmitting the output audio signal.

32. The method of claim 30, wherein the masking signal falls within a critical band of the data signal.

33. The method of claim 30, wherein the generating a data signal includes:

modulating data with a carrier signal in the range of frequencies and apart from the one portion.

34. A method of processing a combined audio signal, comprising:

receiving the combined audio signal including a masking signal residing in a frequency range, a data signal residing in the frequency range, and audio information residing outside frequency range;

separating the masking signal and the data signal in the frequency range from the audio information outside the frequency range; and

filtering the data signal in the frequency range from the masking signal.

35. The method of claim 34, wherein the masking signal resides in a first portion of the frequency range that is distinct from a second portion of the frequency range in which the data signal resides.

36. The method of claim 34, further comprising:

decoding or demodulating the data signal after the filtering to extract data from the data signal.

APPENDIX II - EVIDENCE

None.

APPENDIX III - RELATED PROCEEDINGS

None.